Chapter 9
GENERAL SUPPLY, MAINTENANCE, AND AMMUNITION STORAGE FACILITIES

Adequate logistic facilities are vital if combat operations are to be effectively supplied. Theater engineers provide, maintain, and repair facilities for receiving, storing, and distributing all classes of supply, and supporting all other logistic functions. This chapter addresses the procurement, construction, maintenance, and repair of logistic facilities, both for general supply and for the more specialized purpose of storing munitions.

Engineers tasked to support logistic installations have three major missions: provide new facilities; maintain existing facilities; recover and repair facilities damaged by hostile actions.

In the European Theater, peacetime construction and host nation agreements have provided extensive facilities. In less-developed theaters, there may be no preexisting logistic facilities. In such theaters, logistic support installations must be provided by adapting and converting commercial property to military use, or by constructing new facilities.

SUPPLY AND MAINTENANCE FACILITIES

Logistic installations vary widely. The simplest installation may be a hardstand surface with rudimentary surface drainage and a supporting road system. More complex installations may look like urban industrial parks, including warehouses, maintenance and repair facilities, water, sewage, and electrical utilities, refrigeration or other climate control capability, and supporting roads, railroads, ports, airfields, protective fencing, fire services, and personnel support administration facilities. Logistic installations (LI) include general, ammunition, and maintenance depots, storage sites, and hospitals. Medical treatment facilities and enemy prisoner of war facilities are covered in Chapter 15.

CONSTRUCTION RESPONSIBILITY

The theater commander identifies the minimum essential engineering and construction requirements for facilities, including new construction and repair of war-damaged facilities. The Theater Army Engineer Command (ENCOM) is responsible for planning, prioritization, and tasking subordinate units for project execution.

The ENCOM also provides construction and restoration support for the Air Force when required tasks exceed the Air Force's organic capability. Support may also be provided to allied forces when they are assisting US operations. The theater commander may designate a regional wartime theater construction manager (TCM) to coordinate and prioritize engineer construction activities of all services in a geographic area. Detailed command and support relationships in the theater and COMMZ are given in FM 100-16.

PLANNING FACTORS

In both developed and contingency theaters, it is necessary to determine requirements for time-phased facility construction, war damage repair, construction material, and other engineering needs for supporting deployed US forces. In developing and evaluating alternatives, planning should result in—

- Determination of critical requirements, duration of construction projects, and information for scheduling and requisitioning.
- A logical task sequence based on priorities necessary to accomplish the mission.
- An accurate estimate of required materials and labor that takes into account host nation guidelines and resources.
- Determination of command and support relationships, providing for engineering coordination throughout the theater or area of operation.
- Identification of a method of controlling the situation as it develops or changes.

SITE SELECTION

A preliminary reconnaissance, usually followed by a field reconnaissance, must be conducted. Preliminary reconnaissance sources of information and techniques are discussed in Chapter 4 of this manual. The field reconnaissance team should be composed of, but not limited to, representatives of those units which the facility will support, the S-3 of the unit responsible for construction, a command group representative, a civil affairs personnel representative, and a representative of the host nation. Emphasis should be placed on the following considerations:

Ž Tactical situation.

Ž Capability to defend the site.

Ž Terrain.

- Availability of suitable existing facilities that may be either occupied immediately or modified to desired specifications.
- Environmental restrictions which may limit the size of the required facility (these may be caused by weather or host nation policy).
- Accessibility to projected traffic.
- Availability of construction materials.
- Climatic extremes which may demand refrigeration or other climate control measures.

PROTECTION

Protection of a facility or installation maybe accomplished by active and passive security measures, including facility hardening and dispersion. The enemy situation must be evaluated as thoroughly as possible. Threats to supply and maintenance facilities may include conventional or nuclear/chemical attacks delivered by artillery, missiles, or aircraft. Remote delivery of mines should also be considered. Covert activities maybe a threat following the insertion of deep-strike forces. In determining how to best protect a facility against interdictory attacks, the commander must take into account the surrounding terrain, weather, the availability of Class IV and V materials to support protective measures, and the enemy situation. Another consideration that may influence the commander's decision is the host nation policy governing construction and use of construction resources.

Facility hardening

Hardening of facilities should be emphasized when terrain constricts dispersion and Threat analysis indicates that the facilities are possible targets for enemy weapons. Hardening techniques are discussed in FM 5-103.

Dispersion

Where terrain conditions permit, facilities should be dispersed to prevent the enemy from inflicting massive damage in a single strike. Precautions must be made, however, to ensure that operations are not unduly hampered by ill-planned dispersion schemes.

Security

Generally, security includes active and passive measures taken to thwart enemy troop interdiction. Active measures may include construction of fire fighting positions, barbed wire obstacles, earthen barriers, minefield, placement of remote sensors, and use of security patrols. Passive measures may include use of camouflage and decoy systems and the enforcement of light discipline.

Refer to AR 50-6 and AR 190-11 for required security measures for ammunition supply points. Engineer tasks that support security measures include clearing a right of way for security fences and constructing guard posts, fences, and lighting systems. Protective minefield may be required in some cases.

LAYOUT

In siting and laying out an installation, the commander, with the assistance of the staff, evaluates all the information gathered in the planning and reconnaissance phases. Once the commander or the designated representative has made a decision on where the installation is to be built, the engineer develops a construction plan that takes into consideration available resources (military, host nation, or contract construction personnel, materials, and equipment). The layout should be organized in such a way that it can be completed soon enough to meet the priority scheme. Internal operating efficiency must also be considered *in* the layout. The Army Facilities Components System (AFCS) TM 5-302, illustrates typical installation layouts.

CONSTRUCTION

New construction must be held to the minimum. Whenever feasible, facility requirements must be met by existing facilities (US and host nation), organic unit shelters, and portable or relocatable facility substitutes.

Standards for new construction (initial or temporary) are dictated by the theater commander, based upon expected duration of use, the availability of materials, man-hours of construction effort, and material cost (TM 5-301). Locally available materials may dictate design and construction criteria. Plans are provided for many supply and maintenance facilities in TM 5-302.

CONVERSION OF EXISTING FACILITIES

Instances may arise when it will be better in terms of labor, material, and time, to modify existing facilities. Chapter 12 discusses procedures for acquiring existing facilities and other real property in the Theater of Operations. Host nation agreements may require compensation for using or converting such facilities. Army engineers and host nation and civilian contractors are encouraged to use ingenuity, imagination, and inventiveness to adapt existing facilities for military use.

MAINTENANCE AND REPAIR

Routine maintenance and repair of facilities is accomplished by user units through unit-appointed teams. Army engineers perform maintenance and repair work that exceeds the capabilities of user units. This support usually requires specialized skills or heavy equipment. Further information on Real Property Maintenance Activities (RPMA) is given in Chapter 13.

AMMUNITION STORAGE AND SUPPLY

A well developed Theater of Operations needs a network of ammunition supply and storage facilities. Well situated and stocked ammunition storage and supply facilities are critical to the timely distribution of required munitions. Ammunition must be stored with maximum attention to protection against natural and man-made threats, including accidents caused by careless storage and handling. Class V and Class V (W) (aircraft ordnance) supply items are explosive and often contain sensitive components. Improper, careless, or rough storage and handling of ammunition and explosives may result not only in malfunctions, but may also cause accidents which result in loss of life, injury, or property damage. Properly designed, constructed, and maintained ammunition storage and supply facilities will help limit the possibility of such accidents. Appropriate storage ensures maximum serviceability and shelf life of stocks, and reduces maintenance requirements to a minimum.

THEATER STORAGE LOCATIONS

The Theater Storage Area (TSA) or depot, is usually located within the COMMZ, and serves as the initial storage and distribution point for theater munitions. Ammunition may be pushed forward to Corps Storage Areas (CSA), where further distribution is made to forward Ammunition Supply Points (ASP). These are located in the division rear. Units may then draw directly from ASPS. Ammunition may be brought further forward to Ammunition Transfer Points (ATPs) where munitions are transferred from corps stake and platform semitrailers to user resupply vehicles.

Generally, the further to the rear the ammunition facility is, the more elaborate the

construction, and the more extensive the construction support required. Depending upon the extent of a contingency operation, land based ammunition supply and storage facilities may also be desired. Their construction may be less elaborate than the developed theater counterpart, but security and safe and efficient operation must still be considered.

CONSTRUCTION RESPONSIBILITIES

Engineer elements, under the appropriate Army command, are charged with the following construction responsibilities in support of ammunition storage and supply operations:

- Reconnaissance and improvement and/or construction of roads and bridges which provide access to and egress from the ammunition facility. Engineers will also construct roads within the facility.
- Location of water sources for fire fighting operations and construction of required reservoirs or water distribution system.
- Construction of standard ammunition storage magazines for indoor storage, or berms and pads for outdoor storage. Engineers may be tasked to supply appropriate dunnage for ammunition stacks, in accordance with TM 9-1300-206.
- construction of firebreaks in and around the facility.
- Construction of quarters and support facilities for ammunition facility personnel and security forces. This includes associated power and sanitary requirements.
- Construction and maintenance of perimeter security fences, lighting systems or other required obstacles.

PLANNING FACTORS

Planners must consider a number of factors when they are designing ammunition storage and supply facilities, including drainage, shelter, ventilation, facility size, vehicle access, water supply, and protection.

Drainage

Munitions can be damaged by excessive moisture, and must be kept dry. Proper grading and, where possible, the installation of drainage facilities in the area of the ammunition facility will divert rainfall and ground water away from ammunition stacks.

Shelter

Ammunition and explosives must be sheltered, wherever possible, from the elements and the enemy. Depending upon the situation and the assets available, these shelters may range from approved steel, arch-earth mounded igloos, to an outdoor modular storage system reinforced with earthwork berms. These systems are discussed in detail in FM 9-38.

Ventilation

Adequate ventilation is required to protect stocks from moisture and to prevent the buildup of toxic and combustible gases.

Size

The size of the facility depends on the kinds and quantities of munitions being handled. Facility size will be determined by the logistical unit commander, based on standards set forth in TM 9-1300-206 and the tactical situation.

Vehicle access

Vehicles that use the ammunition facility must be able to travel to and from the appropriate pickup points. Road networks and traffic flow patterns inside the facility must support concurrent resupply and issue operations, and provide for rapid evacuation of all

vehicles in case of emergency. Fire fighting equipment must have access to all parts of the facility.

Water supply

Water tanks and reservoirs must be located to support fire fighting activities. Refer to TM 9-1300-206 for siting and resupply requirements, and to FM 5-315 for fire fighting procedures.

Facility protection

Protection of an ammunition facility maybe accomplished through a combination of facility hardening and dispersion, and active and passive security measures. These measures are similar to those described in the section on maintenance and supply facilities in this chapter (page 80). Generally, the Area Damage Control (ADC) plan (Chapter 14) will stipulate what measures must be taken before, during, and after a damage incident, and who will be responsible for each measure.

SITING AND LAYOUT

Location

The location of ammunition storage and supply points is determined by the logistical unit commander. A location must first serve the needs of maneuver forces. The ASP is located within reasonable support distance of maneuver elements. It is desirable to place the ASP near an established MSR (road or rail) in order to make stocking and distribution easier. However, ammunition storage facilities should not be placed too near major facilities such as airfields, POL storage, and ports. Taking this precaution will reduce concurrent destruction as a result of enemy targeting on other facilities.

Within tactical constraints, the best possible site characteristics should be chosen. Level terrain with existing natural barriers and good drainage is preferable. This will serve to reduce earthwork requirements. If possible, existing facilities or structures suitable for conversion to storage areas should be used. The engineer advises the logistical unit commander on such matters as location of construction materials, topography, drainage, and the condition of local road and bridge networks. Consideration must also be given to security and ease of defense. Wherever possible, sites should provide a defilade to give concealment from enemy observation.

Layout

Specific layout of an ammunition supply or storage facility depends on the tactical situation, the terrain, and the type and amount of ammunition being handled. Engineers supporting construction of ammunition supply and storage facilities advise the appropriate commander on construction and maintenance matters. If required by the tactical situation, the facility may have to receive and issue ammunition before construction operations are finished. Engineers may have to alter construction plans and techniques to allow for safe and efficient handling of ammunition while construction proceeds. Ammunition storage facilities are best arranged in dispersed storage areas. Separation of facilities provides protective dispersion, and expedites the handling, receipt, and issue of materials, and facilitates inventory and segregation. The road network is designed so that each area can be entered and exited independently. This prevents crossing traffic in all areas.

Firebreaks wide enough (50 feet minimum) to prevent fires from spreading should also be maintained. Soil that contains enough organic matter to allow it to burn must be excavated to the mineral subsoil. Since firebreaks around ammunition stacks are easily detected by aerial reconnaissance, their use may have to be restricted.

STORAGE AND HANDLING

As previously mentioned, existing buildings may be used for ammunition storage as long as the rated floor load is sufficient. Chemical, incendiary, and white phosphorus rounds should not be stored on wooden floors, since they are a fire hazard. Refer to TM 5-302 for specific layouts for ammunition facilities, and for design plans for ammunition storage magazines.

Ammunition and explosives may be stored outdoors in accordance with TM 9-1300-206, which details site and layout requirements for outdoor storage of ammunition. These supplies may also be stored on vehicles for adequate dispersion and rapid deployment. Engineer units usually have a sizeable material-handling capability, and may be required to support ammunition storage and supply operations with material-handling equipment.

CLIMATE

Special effects imposed by the local climate must be taken into consideration in the design and construction of ammunition storage facilities.

Desert

In the desert, the need for dispersion is extremely important since natural concealment is generally quite sparse. Shadows and regular shaped patterns are conspicuous and can be avoided by the use of small, irregular stacks and the elimination of regular lines and rows. In this environment, engineers are seldom required to develop road networks.

Arctic/cold weather

In a cold weather climate, care must be taken to provide adequate dunnage for ammunition storage. Defilades must be avoided. They may be susceptible to flooding following a thaw. Engineer assets may be used to clear and maintain the road network in snow and icy conditions.

Tropics

Maximum effort must be made to combat the effects of moisture. Adequate shelter, dunnage, and ventilation must be provided as necessary.